Institute for Materials Science

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Institute for Materials Science Distinguished Lecture Series

Doctor Peter Wölfle
Professor Emeritus
Institute for Theoretical Condensed Matter Physics (KIT)

The Exotic World of Quantum Matter:
Novel States Induced by Fluctuations

Tuesday, June 30, 2015
2 - 3pm
MSL Auditorium (TA-03 - Bldg 1698 - Room A103)

Abstract: The talk reviews established concepts of quantum matter and more recently discovered unexpected properties leading beyond. The low energy excitations of quantum matter generally have particle-like character. However, the character of these quasiparticles may be changed by fluctuations, e.g. at a classical or a quantum phase transition into an ordered state. Inside the ordered phase the quasiparticles may be reborn in different form, together with other kinds of new quasiparticles.

Examples are quantum phase transitions of metals into an antiferromagnetic state where "critical" quasiparticles are observed to form, or into a superconducting / superfluid state. Fluctuations may also be enhanced by frustrating interactions or by dimensional reduction, leading to new types of quasiparticles. As examples frustrated quantum magnets with "spinon" excitations, and one-dimensional quantum wires, with “chargons” will be considered. In Quantum Hall systems "chiral quasiparticles", "composite fermions" and fractionally charged quasiparticles are found. Most recently topological insulators and Majorana fermions are in the focus of attention.

Biography: Peter Wölfle is an internationally renowned theoretical physicist with major contributions to condensed matter theory in systems with strong electronic correlations, mesoscopic systems and disordered systems. His pioneering works on quantum transport theory and the theory of quantum fluids have had great impact on current research efforts. His more recent work is on quantum criticality of metallic systems and on frustrated magnetic systems.

He is the recipient of numerous awards, most recently the *Gentner-Kastler Prize of the Société Française de Physique*, the *Deutsche Physikalische Gesellschaft* and the *Simon Memorial Prize of the Institute of Physics*. He has 250 publications in refereed Journals to his name.

For over 20 years he was a Professor at Institute for Theory of Condensed Matter, Universität Karlsruhe (as of 2009: Karlsruhe Institute of Technology (KIT)) and since 2010 has been Professor Emeritus and Consultant at KIT.

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Hosted by Alexander Balatsky
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